Answer **all** the questions.

1 **(a)** Find the highest common factor of 540 and 90.

Answer ..... [1]

(b) Find $\sqrt[3]{9261}$ by using prime factorisation.

Answer ..... [2]

---

2 From the following set of numbers

$$-\frac{1}{5},\ 0,\ \sqrt{3},\ \sqrt[3]{27},\ \pi,\ -100$$

(a) Write down

(i)all the integer(s),

Answer ..... [1]

(ii)all the irrational number(s).

Answer ..... [1]

(b) Arrange the given set of numbers in ascending order.

Answer ..... [1]

---

3 Calculate $\frac{0.569+\sqrt{18.5694}}{0.7532-1.412^3}$, giving your answer correct to 3decimal places.

Answer ..... [2]

---

4 Round off the following numbers to 3 significant figures.

(a) 650 628

Answer ..... [1]

(b) 0.000470325

Answer ..... [1]

---

5 The original price of a television is \$2200. It was sold to a shop for \$2560.

(a) Calculate the percentage increase in the price of the television.

Answer .....% [2]

(b) In the shop, the marked price of the television is \$3240.
A man bought it at a 5% discount during a sale.
Find the amount the profit earned by the shop.

Answer \$..... [2]

---

6 **(a)** Express $5\frac{1}{4}$ as a percentage.

Answer .....% [1]

(b) Express 0.25% as a fraction in its simplest form.

Answer ..... [1]

---

7 **(a)** Add brackets to the expression below to make it correct.

$$126 \div 9 \times 7 + 47 - 39 = 10$$ [1]

(b) Fill in the boxes with the correct operations to make the mathematical sentence true.

$$27 \square 3 \div 9 - 6 \square 3 = 0$$ [2]

---

8 Factorise fully

(a) $9xy - 3y + 18xyz$,

Answer ..... [1]

(b) $3x(y-1) - 9x(1+y)$.

Answer ..... [2]

---

9 **(a)** Simplify $6x - 3y + 2x + 8z - 2y$.

Answer ..... [1]

(b) Expand and simplify $2(3x+4y) - 5(2x-5y)$.

Answer ..... [2]

---

10 Jane has a box of pens.

$\frac{1}{4}$ of the pens are red.
40% of the remainingpens are green.
The rest of the 486 pens are blue.
How many pens are there in the box altogether?

Answer .....pens [3]

---

11 If $\frac{25x-3y}{8x+2y}=\frac{5}{2}$, find the ratio $x : y$.

Answer ..... [2]

---

12 Eva, Faith and Grace shared a sum of money between them in the ratio 2 : 5 : 8.
Grace has $57 more than Faith. How much money did all three of them have altogether?

Answer $..... [2]

---

13 **(a)** It is given that $p = \frac{1}{3}$, $q = -\frac{2}{5}$ and $r = \frac{1}{2}$.

Find the value of $\frac{p+r}{q-r}$.

Answer ..... [2]

(b) Solve the following equation

(i) $\frac{7y+4}{3y-5} = -3$,

Answer y=..... [2]

(ii) $\frac{2x+5}{3} - \frac{x+3}{8} = 0$.

Answer x=..... [2]

---

14 A shopkeeper bought 72 apples for \$$x$ per dozen. He then sold them for \$$\frac{x}{6}$ each

(a) Find an expression, in the simplest form in terms of x, for the profit he makes if he sold all apples.

Answer \$..... [2]

(b) Hence, solve for x if he makes a profit of \$42.

Answer x=..... [1]

---

15 **(a)** Solve the inequality $2x + 3 \geq 15$.

Answer [1]

(b) Hence, write down the smallest value of x which satisfies $2x + 3 \geq 15$ if

(i) x is a prime number,

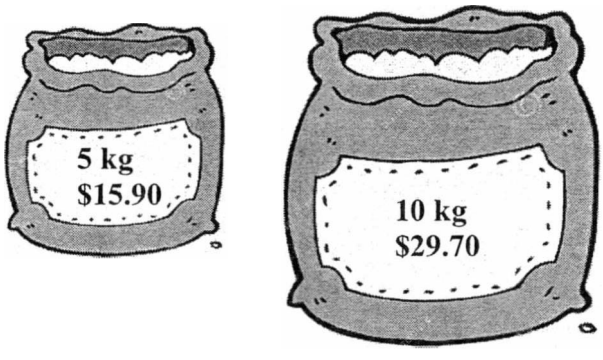
Answer x=..... [1]

(ii) x is an even number.

Answer x=..... [1]

---

16 Two different sizes of bags of rice are shown below.
The mass of the rice and the price are given on the bags.
Which size of bag gives the better value? You must show all your working clearly.



Answer:.....

..... [2]

---

17 The first three figures of a sequence are as shown.

Figure 1 (T_1)

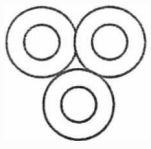


Figure 2 (T_2)

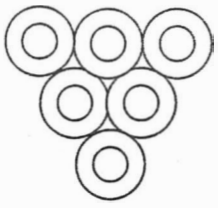


Figure 3 (T_3)

(a) Complete the following sequence [1]

Number of circles 2, 6, 12, ____ , ____ , ____ .

(b) Given that $T_1 = 2 = 1 \times 2$
$T_2 = 6 = 2 \times 3$
$T_3 = 12 = 3 \times 4$

Let n denote the pattern number and c the corresponding number of circles.
Write a general formula that connects n and c.

Answer T_n=..... [2]

(c) Find the number of circles in the 55th pattern.

Answer .....circles [1]

END OF PAPER 1

Answer **all** the questions.

1 The time taken for a 3D printer to print a figurine is 75 minutes.
After printing, each figurine will be polished and packed before delivery.

(a) Find the total time taken, in hours, to print 40 figurines. [1]

(b) The time taken for printing, polishing and packing can be expressed in the ratio of 5:4:1 respectively.
Find the time taken to polish a figurine and the time required to pack a figurine. [2]

(c) The company managing this project is given 10 work days to complete it.
With a maximum of 8 working hours per work day, the company foresees that they will not have sufficient time to finish the project.
How many more hours does the company need? [2]

(d) The maximum working hours per work day is increased by 25%.
Determine if the company is able to complete the project within 10 work days. [2]

---

2 **(a)** During a walk-and-jog event, runners are flagged off from the starting point in waves of 50 every 3 minutes.

(i) Calculate the time needed to flag off 1400 runners from the starting point. [1]

(ii) Calculate the maximum number of runners that can be flagged off in an hour. [2]

(b) Solve the inequality $-3x \leq 21$.
Represent your solution on a number line. [2]

(c) The temperature in Thailand was taken on three successive days.
The temperature on first day was 2.5°C higher than the second day, and second day 3.5°C lower than the third day.
The average temperature of the three days is 33.5°C.
Find the temperature in Thailand on the first day. [2]

---

3 **(a)** **(i)** The price of a computer at in 2004 was \$495 inclusive of 5% Goods and Services Tax (GST).
Find the price of the computer before GST, correct to the nearest dollar. [2]

(ii) As announced in Budget 2007, the GST rate was raised to 7% on 1 July 2007.
Find the price of the computer including the GST in 2008, correct to the nearest cent. [2]

(b) One day the rate of exchange between Singapore dollars (\$) and pounds (£) was \$1 = £0.51.
On the same day, the rate of exchange between Singapore dollars and euros (€) was \$1= €0.65.

(i) Trina changed \$500 into pounds.
Calculate how many pounds she received. [1]

(ii) Raphael changed 500 pounds into euros.
Calculate how many euros he received, correct to the nearest euro. [2]

---

4 **(a)** Both liquids P and Q used in an experiment were at a temperature of $-7\,^{\circ}C$.

(i) Liquid P was heated until its temperature rose by 12°C.
Write down its new temperature. [1]

(ii) Liquid Q was cooled until its temperature fell by 5°C.
Write down its new temperature. [1]

(iii) Hence, find the difference between the final temperatures of the two liquids. [1]

(b) A carpenter needs at least 700 nails to construct a wooden structure.
The nails are sold in packets of one dozen.
Use inequality to find the minimum number of packets of nails he has to buy. [3]

(c) What must be added to $4x^3 - 3x^2 + 2x - 5$ to get $9 - 4x + 5x^2 + 7x^3$? [3]

---

5 **(a)** Factorise completely

(i) $3ab + ab^2$, [1]

(ii) $2m(3m - n) + 4n(3m - n)$, [2]

(b) Expand and simplify $\frac{3}{4}[\ 3(3p - 2q) - 5(p - 2q)\ ]$. [2]

(c) Simplify

(i) $\frac{x}{5} - \frac{x - 5}{15}$, [2]

(ii) $16yz^2 \div \frac{1}{3y}$. [2]

---

6 **(a)** **(i)** Express 240 as a product of its prime factors in index notation. [1]

(ii) Given that $240k$ is a square number, find the smallest positive integer value of k. [2]

(b) Bell A and Bell B ring at regular intervals of 5 minutes and t minutes respectively. Both bells will first ring together at 1200and subsequently every 15 minutes.

(i) Find the possible values of t. [2]

(ii) Given that thefinal ring for both the bells is at 1300 on the same day, calculate the number of times Bell A rang by itself. [2]

(c) If x and y are factors of a number k, then the product of x and y is also a factor of k. Give an example to show that the above statement is false. [2]

(d) If k is the LCM of x and y, then k is divisible by the factors of both x and y. Determine, with explanation, whether the above statement is true or false. [2]

~ End of paper ~

2016 Secondary One Express SA1 Paper 1

Answer Scheme

General feedback:

- Use of arrow and dash

1a 1b	90 ------B1 $9261 = 3^3 \times 7^3$ --------M1 $\sqrt[3]{9261} = 3 \times 7 = 21$ ------A1	a) Well done question b) Many students wrote this in their working: " $(3 \times 7)^3 = 3 \times 7$
2ai 2aii 2bii	$\sqrt[3]{27}$, -100 and 0 ------B1 $\sqrt{3}$ and π -------B1 -100, $-\frac{1}{5}$, 0, $\sqrt{3}$, $\sqrt[3]{27}$, π -------B1	2bii) Students must write down the exact values in correct sequence. i.e not acceptable if student replaces $\sqrt[3]{27}$ with 3.
3	-2.366 -------B2	
4a 4b	651 000 -------B1 0.000470 -------B1	Common mistake: 651 0.00047
5a 5b	percentage increase $= \frac{2560 - 2200}{2200} \times 100\%$ ---------M1 $= 16.4\%$ (3sf)----------A1 Or $= 16\frac{4}{11}$ or $= 16.\dot{3}\dot{6}$ Amount the man paid $= \frac{95}{100} \times 3240$ $= \$3078$ ----------M1 Profit $= 3078 - 2560$ $= \$518$ -------A1	Well done question Common mistake: • $3078 - 3240 = \$162$ • Students did not find the profit
6a 6b	525% -------B1 $\frac{1}{400}$ ---------B1	Well done
7 a 7bi 7bii	25 , 36 -----B1 29 -----B1 50 -----B1	Well done

8a 8b	$3y(3x-1+6xz)$ ---------B1 $3x(y-1)-9x(1+y)$ $=3[y-1-3-3y]$----------M1 $=x(-4-2y)$ $=-6x(y+2)$ ---------A1 Or $=6x(-y-2)$ -A1	Badly done as students did not factorise fully or expand instead of factorise.
9	$6x-3y+2x+8z-2y$ $=8x-5y+8z$ --------B1 $2(3x+4y)-5(2x-5y)$ $=6x+8y-10x+25y$ -------M1 $=-4x+33y$ ----------A1	Badly done. Common mistake: a) $-3y-2y=-5y$ b) $2(3x+4y)-5(2x-5y)$ $=6x+8y-10x-25y$ -------M1 $=-4x-17y$ ----------A1
10	Let the number of pens be x. Number of red pen $=\frac{1}{4}x$ Number of green pens $=\frac{3}{10}x$ Number of blue pens $=1-\frac{3}{10}x-\frac{1}{4}x$ $=\frac{9}{20}x$ ---------M1 $486=\frac{9}{20}x$ ----------M1 $x=1080$ --------A1	Poor presentation of working. Many students use "3u=$57", without explaining what is u. Students must take note of this as we are using alphabet as variables in algebra. Many students did not provide clear statement as well. A lot use of arrow and dash.
11	$\frac{25x-3y}{8x+2y}=\frac{5}{2}$ $2(25x-3y)=5(8x+2y)$ $50x-6y=40x+10y$ $50x-40x=6y+10y$ $10x=16y$ -------M1 $\frac{x}{y}=\frac{16}{10}$ ratio is 16:10 -------A1 8:5	Common mistake is 5:8 Badly done question, students do not know the approach.
12	3 units represent $57 15 units represent $=\frac{57}{3}\times 15$ ----------M1 =$285 -----A1	Well done but students must take note of their presentation of working.
13a	It is given that $p=\frac{1}{3}$, $q=-\frac{2}{5}$ and $r=\frac{1}{2}$.	Many students did not use

	$\frac{\frac{1}{3}+\frac{1}{2}}{\frac{-2}{5}-\frac{1}{2}}$ ------M1 $=-\frac{25}{27}$ -----A1	calculator. Many use $q=\frac{2}{5}$
13bi	$\frac{7y+4}{3y-5}=-3,$ $7y+4=-3(3y-5)$ $7y+4=-9y+15$ --------M1 $7y+9y=-4+15$ $16y=11$ $y=\frac{11}{16}$ ------A1	Students got to work in fraction. Many did not score for this question. Weak in algebraic manipulation.
13bii	$\frac{2x+5}{3}-\frac{x+3}{8}=0$ $\frac{2x+5}{3}=\frac{x+3}{8}$ $8(2x+5)=3(x+3)$ $16x+40=3x+9$ ---------M1 $13x=-31$ $x=-\frac{31}{13}$ --------A1 Or $x=-2\frac{5}{13}$	
14a	$72(\frac{x}{6})-6x$ -------M1 $=\$6x$ ---------A1	Many students gave M1 as the final answer and did not elaborate further.
14b	$6x=42$ $x=7$ -----B1	
15a	$2x+3\geq 15$ $2x\geq 12$ $x\geq 6$ ------B1	Some students left their answer simply as 6.
15bi	$x=7$ ------B1	
15bii	$x=6$ ------B1	
16	It is \$3.18 per kg for the smaller bag and \$2.97 per kg for the bigger bag. ---------- B1 Hence, the bigger bag gives a better value. ----------B1 (awarded with clear supporting reason)	Well done question. Students must take note that they can use mathematics calculation to prove.

17a	20, 30, 42 ----B1	Well done question.
17b	$T_n=c=n(n+1)$ Or $T_n= n^2+n$ ---------B2	No mark given if student missed out c in the equation.
17c	$55 \times 56 = 3080$ ----------B1	

Answer all the questions.

1 **(a)** Total time taken = 75 x 40
= 3000 mins
= **50 h** **[B1]**
* Only accept answer in **hours** (stated in Qn).

(b) Time taken for polishing 1 figurine = $\frac{4}{5} \times 75$
= **60 mins** or **1 h** **[B1]**

Time taken for packing 1 figurine = $\frac{1}{5} \times 75$
= **15 mins** or **0.25 h** **[B1]**
* Time taken is for **1 figurine**, not 40 figurines.
* Two separate timing, not combined timing (Read Qn)

(c) Total time needed = $40 \times (75 + 60 + 15)$
= **100 h** or **6000 mins** **[M1]**
* Total time taken to **print, polish and pack** 40 figurines.
* Some calculated by "figurine / day"....

Total available working hours = 8 x 10
= 80 h
* No marks for finding this value.

No. of additional hours needed = $100 - 80$
= **20 h** **[A1]**
* Marks given for finding **additional hours needed**.

(d) New working hours per day = $125\% \times 8$
= **10 hours** **[M1]**
* **New working hours per working day.**

New total available working hours = 10×10
= 100 hours

Since the available working hours is equal to the total time needed to complete the project, the company **will be able to complete the project within 10 work days.** **[A1]**
* Must have **concluding statement**. (Answer Qn! Proper description in future!)
* Additional hours given = additional hours needed

2 (a) (i) No. of waves of runners = $1400 \div 50$
= 28 waves
Time needed = $(28 - 1) \times 3$
= **81 minutes** **[B1]**

* Time to **flag off first wave**= ??

(ii) No. of waves in an hour = $(60 \div 3) + 1$
= **21 waves** **[B1]**

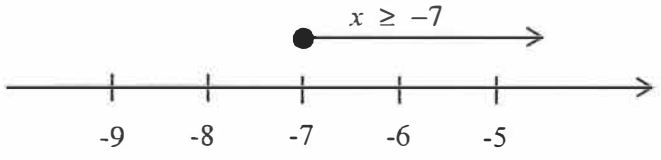
* How long to **flag off Wave 1**??

Max no. of runners in an hour = 21×50
= **1050 runners** **[B1]**

* As long as I can see "... **x50**", flag.

(b) $-3x \leq 21$
$x \geq 21 \div (-3)$
$x \geq -7$ **[M1**: Correct Inequality**]**

* Must be **x** on LHS of inequality.
* Forgot to flip the inequality sign when multiply "-1" to both sides.



[A1: Correct Number Line and Arrow **]**

* Inequality must be correct.
* Solid dot above -7, arrow point right
* Increasing order of intervals of no. line.

(c) Let Temperature on first day = t °C
Temperature on second day = $(t - 2.5)$ °C
Temperature on third day = $(t - 2.5 + 3.5)$ °C
= $(t + 1)$ °C **[M1]**

* Find way to relate the temp of three days
* One unknown is enough!

$t + (t - 2.5) + (t + 1) = 3 \times 33.5$
$3t = 102$
$t = 34$°C
The temperature on the first day is **34°C**. **[A1]**

3 (a) (i) Price of computer before GST $= \frac{100\%}{105\%} \times \$495$ [M1]

$=$ **$471 (to nearest dollar)** [A1]

* Read Qn for degree of accuracy!
* Rounding off error!!

(ii) Price of computer in 2008 $= \left(\frac{100\%}{105\%} \times \$495\right) \times \frac{107\%}{100\%}$ [M1]

$=$ **$504.43 (to nearest cents)** [A1]

* Read Qn for degree of accuracy!
* Rounding off error!!

(b) (i) Amount of pounds Trina received $= 500 \times 0.51$

$=$ **£225** [B1]

(ii) Amount of Singapore dollars Raphael received $= \$\left(\frac{500}{0.51}\right)$ [M1]

Amount of euros Raphael received $= \left(\frac{500}{0.51}\right) \times 0.65$

$= 637.254...$

$=$ **€637** [A1]

* Rounding off error!!
* Use most accurate value for calculation

---

4 (a) (i) New temperature of Liquid P $= -7 + 12$

$=$ **5°C** [B1]

(ii) New temperature of Liquid Q $= -7 - 5$

$=$ **−12 °C** [B1]

(iii) Difference between final temperature $= 5 - (-12)$

$=$ **17°C** [B1]

* Difference = Larger − Smaller

(b) Let number of packets of nails needed be *n*.

$n \times 12 \geq 700$ [M1]

$n \geq 700 \div 12$

$n \geq 58\frac{1}{3}$ [M1]

* 700 divided by 12 = no. of packets.
* Not suppose to round off to 58.

Therefore the number of packets of nails to be bought is **59 packets.** [A1]

* Only if above two parts above are done correctly.

(c) $(9 - 4x + 5x^2 + 7x^3) - (4x^3 - 3x^2 + 2x - 5)$ **[M1]**

$= 9 - 4x + 5x^2 + 7x^3 - 4x^3 + 3x^2 - 2x + 5$ **[M1]**

$= \underline{3x^3 + 8x^2 - 6x + 14}$ **[A1]**

---

5 **(a)** **(i)** $3ab + ab^2 = \underline{ab(3 + b)}$ **[B1]**

(ii) $2m(3m - n) + 4n(3m - n) = (2m + 4n)(3m - n)$ **[M1]**

$= \underline{2(m + 2n)(3m - n)}$ **[A1]**

(b) $\frac{3}{4}[\,3(3p - 2q) - 5(p - 2q)\,] = \frac{3}{4}[\,9p - 6q - 5p + 10q\,]$ **[M1]**

$= \frac{3}{4}[\,4p + 4q\,]$

$= \underline{3p + 3q}$ **[A1]**

(c) **(i)** $\frac{x}{5} - \frac{x - 5}{15} = \frac{3x - (x - 5)}{15}$ **[M1]**

$= \frac{3x - x + 5}{15}$

$= \underline{\frac{2x + 5}{15}}$ **[A1]**

(ii) $16yz^2 \div \frac{1}{3y} = 16yz^2 \times 3y$ **[M1]**

$= \underline{48y^2z^2}$ **[A1]**

---

6 **(a)** **(i)** $240 = \underline{2^4 \times 3 \times 5}$ **[B1]**

(ii) (Since $240k$ is a square number, when expressed in index notation, the power of all its prime factors should be even.)

$240k = 2^4 \times 3^2 \times 5^2$ **[M1]**

$k = \frac{2^4 \times 3^2 \times 5^2}{2^4 \times 3 \times 5}$

$= 3 \times 5$

$k = \underline{\mathbf{15}}$ **[A1]**

Thus the smallest positive integer value of k is 15.

(b) **(i)** It is given that LCM of 5 and t is 15.
Factors of 15 are 1, 3, 5 and 15.

When $t = 1$, LCM of 5 and $t = 5$
$t = 3$, LCM of 5 and $t = 15$ (Accept) **[B1]**
$t = 5$, LCM of 5 and $t = 5$
$t = 15$, LCM of 5 and $t = 15$ (Accept) **[B1]**

Therefore the possible values of t are **3 and 15.**

(ii) Total number of times Bell A and Bell B rang together $= \frac{60}{15} + 1$
$= 5$

Number of times Bell A rang $= \frac{60}{5} + 1$
$= 13$ **[M1: Considers first ring at 12 00]**

Number of times Bell A rang by itself $= 13 - 5$
$= 8$ **[M1]**

(c) Let $k = 12$, $x = 4$ and $y = 6$.
[B1: selected appropriate numbers as examples]

"Three times 4" and "two times 6" are both equals to 12, therefore 4 and 6 are factors of 12.
The product of x and y however is 24, and 24 is not a factor of 12.
[B1: show *x* and *y* are factors of *k* and compare *xy* with *k*]

Therefore the statement is false.

(d) Factors of a number are also factors of any multiple of that number.
Since x and y are factors of k, the factors of these two variables will also be factors of k.
[B1]

A number is divisible by any of its factors.
Since$k$ is divisible by x and y, it is also divisible by the factors of the two variables.
[B1]

Therefore the statement is true.

~ End of paper ~