Paper 1 Nov. 18

1) $(s^4)^2 = s^8$ ✓

2) Vol. cylinder $= \pi r^2 h$
$= \pi 5^2 8$
$= 200\pi$ ✓

3) $16a^2 + a + 3a \times 2$

remember you cannot combine a^2 with a. It is as if a^2 were a different "letter" of the alphabet.

$\Rightarrow 16a^2 + 7a$

which isn't an option. Have we misread?

Is it $16a^2 \div a + 3a \times 2$

and using BODMAS this is

$16a + 6a = 22a$ ✓

{ This is a poor question as many mathematicians regard the $\div$ sign as splitting the expression into two distinct groups. But discretion is the better part of valour and we just write what the examiner wants to see }

4) $\cos 30°$ is a standard function that we learn off by heart or know how to work it out.

$\cos 30° = \frac{\sqrt{3}}{2}$ ✓

5) $8\frac{1}{2} \div 2\frac{2}{3}$

$= \frac{17}{2} \div \frac{8}{3} = \frac{17}{2} \times \frac{3}{8}$

$= \frac{51}{16} = 3\frac{3}{16}$ ✓

6) Speed $= \frac{\Delta d}{\Delta t}$

$= \frac{116 - 48}{4} = 17$ mph. ✓

7) Sum of angles

quadrilateral is 2 triangles

Total $= 2 \times 180 = 360$

pentagon is three triangles

Total $= 3 \times 180 = 540$

Zak is incorrect in his logic ✓

8) Data given on number planes landing between 10am - 2pm on first 10 days in January.

Foy was clearly on Day 8 as number planes reduced by nearly 1/3. It's an outlier. ✓

b) Estimate is $150 \times \frac{24}{4} \times 365$

$= 150 \times 6 \times 365$

$= 900 \times 365$

$= 36500 \times 9$

$= 328500$ ✓

c) Her prediction could be too low or too high ✓

9) $\sqrt{6^2 + 8^2} = \sqrt[3]{125a^3}$

$10 = 5a$

$a = 2$ ✓

6/8/10 is a pythagorean triangle. Memorise the simpler ones.

3 4 5 8 15 17

6 8 10 16 30 34

9 12 15

10. % increase is always

$$\frac{\text{new value} - \text{old value}}{\text{old value}}$$

$$= \frac{280-80}{80} = 3.5$$

We also need to remember to subtract 1 then $\times 100$.

$(3.5-1) \times 100 = 250\%$ ✓

Does this make sense?

100% of 80 = 80

50% of 80 = 40

$2 \times 80 + 120 = 280$

11) Congruent triangles are A and D ✓

ASA

12) $x^2 - x - 12 =$

$(x-4)(x+3)$ ✓

solutions are $x = 4$ or $x = -3$

Don't forget to reverse the signs.

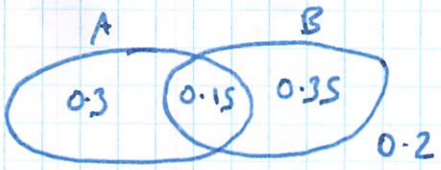
13)

$e : f$ $\times 5$ $2 : 3$ $\times 5$ $10 : 15$

$f : g$ $\times 3$ $5 : 4$ $\times 3$ $15 : 12$

so e:g is 10:12 or 5:6 ✓

14)



$P(A' \cup B) = 0.35 + 0.2 + 0.15$

or more directly $1 - 0.3$

$= 0.7$ ✓

15) The supermarket with the lowest queuing times might be interpreted as the one with the lowest median.

This is supermarket C ✓

The supermarket with the most consistent queuing times is the one with the lowest interquartile range.

A is $12 - 8 = 4$

B is $7 - 5 = 2$ ← so it's B. ✓

C is $8 - 3 = 5$

D is $7 - 4 = 3$

16) $29^3 \simeq 30^3 \simeq 27000$ ✓

which is an option given.

17) $\left(\frac{3}{4}\right)^{-3} = \left(\frac{4}{3}\right)^3 = \frac{64}{27}$ ✓

18) Beth takes 8 days

Mia takes 10 days

Suppose there are 40 documents

Beth translates at 5/day

Mia translates at 4/day

In 2 days Beth translates 10 documents so 30 documents remain

working together takes $\frac{30}{9} = 3\frac{3}{9}$

so total time is $5\frac{1}{3}$ days

In fact the question is how many more days $3\frac{1}{3}$ ✓

19 a) boys : girls

$x : y$

if $x+5 : y+8$

$1 : 2$

remember to swap → $2(x+5) = y+8$

$2x+10 = y+8$

$y = 2x+2$ ① ✓

which is what was to be proved.

b) boys : girls

$x : y$

$x+10 = y+1$

$y = x+9$ ②

so now we have ① = ②

$2x+2 = x+9$

$x = 7$ ✓

$y = 16$ ✓

check

boys	:	girls
7		16
+5		+8
12		24 ✓ checks

7	:	16
+10		+1
17	:	17 ✓ checks.

20) $\angle QPS = 27°$ (angle off chord)

$\angle RPS = \frac{180-50}{2} = 65°$

$\angle QPS = 27° + 65° = 92°$ ✓

If QS were the diameter this angle would be 90° ✓

so QS is NOT a diameter

21)

0	1	2	3	4
0	11	26	45	68
	11	15	19	23
		4	4	4

we can deduce a quadratic from just 3 terms but 4 gives a sense of assurance.

let $f(a) = ax^2 + bx + c$

$a = 4/2 = 2$

$c = 0$ the 0th term.

$a+b+c = 11$

so $b = 9$

So the expression is $2x^2 + 9x$ ✓ which if we work backwards does indeed give the sequence.

This is a very tricky question if you do not happen to know this easy way of deducing a b and c.

LEARN IT: This question crops up about once every 3 years.

22) $\frac{x}{x+4} + \frac{7}{x-2} = 1$

Standard simplification is

$x(x-2) + 7(x+4) = (x+4)(x-2)$

$x^2 - 2x + 7x + 28 = x^2 + 2x - 8$

$5x + 28 = 2x - 8$

$3x = -36$

$x = -12$ ✓

check $\frac{-12}{-8} + \frac{7}{-14} = +\frac{3}{2} - \frac{1}{2} = 1$

✓ checks

23)

	Prism A		Prism B
length	?		30
area	4	:	9
volume	480	:	?

now length will be in ratio

$$2 : 3$$
$$\underline{20} : 30$$

so length $A = 20$

and volume will be in ratio

$$8 : 27$$
$$480 : 1620$$

so volume $B = 1620$

so cross section B given by

$$\frac{1620}{30} = 54 \text{ cm}^2$$

24)

$$\frac{2\sqrt{6}}{\sqrt{5}} - \frac{\sqrt{3}}{\sqrt{10}}$$

$$= \frac{\sqrt{2}}{\sqrt{2}}\frac{2\sqrt{6}}{\sqrt{5}} - \frac{\sqrt{3}}{\sqrt{10}}$$

$$= \frac{2\sqrt{12} - \sqrt{3}}{\sqrt{10}}$$

$$= \frac{4\sqrt{3} - \sqrt{3}}{\sqrt{10}}$$

$$= \frac{3\sqrt{3}}{\sqrt{10}}\frac{\sqrt{10}}{\sqrt{10}}$$

$$= \frac{3\sqrt{30}}{10}$$

To complete this we just have to remember

$$\sqrt{ab} = \sqrt{a} \times \sqrt{b}$$

and we simplify by swapping around this relationship.

eg. $\sqrt{12} = \sqrt{4} \times \sqrt{3}$

$$= 2\sqrt{3}$$

25) Because the curve is symmetrical about the y axis it is an even function and contains no ODD terms.

ie. $ax^2 + bx + c = 0$

and $b = 0$

so as we have $(0, 18)$

then $c = 18$

so $y = ax^2 + 18$

when $y = 0$ $x = \pm 3$

and $ax^2 = -18$

$a = -2$

so $f(x) = -2x^2 + 18$

$= -2(-x+3)(-x-3)$

which if we happen to have a graphical calculator checks out.

26)

$$\text{Area} = \frac{1}{2}ab\sin C$$

$$25\sqrt{3} = \frac{1}{2} \times 20 \times x \times \frac{\sqrt{3}}{2}$$

$$= 5x\sqrt{3}$$

so $x = 5$

and now we use cosine formula

$$w^2 = 5^2 + 20^2 - 2 \times 5 \times 20 \times \cos 60°$$

$\cos 60 = 0.5$

$$w^2 = 25 + 400 - 100$$

$$w^2 = 325$$

$$w = \sqrt{325}$$

$$= \sqrt{25 \times 13}$$

$$= 5\sqrt{13}$$

Nothing particular hard about this except this is a non calculator paper so we need to work through carefully and methodically.

27.

$\cos(180-a)$

$= \cos(-a+180)$

$= -\cos a$

so $\cos(180-a) = -k$ ✓

b) $\cos(360° + a) = \cos a$

$\cos a = k$ ✓

If you have a graphical calculator experiment with these.

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