

1) $a = \begin{bmatrix} 3 \\ -4 \\ -1 \end{bmatrix}$ $b = \begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}$

$2a + b = 2 \begin{bmatrix} 3 \\ -4 \\ -1 \end{bmatrix} + \begin{bmatrix} 1 \\ -1 \\ 3 \end{bmatrix}$

$= \begin{bmatrix} 6 \\ -8 \\ -2 \end{bmatrix}$

2) $2.7 \times 10^3 = 27 = 3^3$

3) $2x = y/w$

$w = y/2x$

4) Bearing C from A

$\angle = 210$

(strictly that unit a "symbol")

5) $n \times 0.4 = 200$
 $n = 200 / 0.4 = 500$

6) $3 \leq 3x < 18$ A
 $1 \leq x < 6$
 $3 < 3x \leq 18$ B
 $1 < x \leq 6$

Solutions A and 12345
 Solutions B are 23456

7. 6 meters to nearest metre
 $5.5m \leq L_1 < 6.5m$

10) $3.5m \leq L_2 < 4.5$

so $9m \leq L_1 + L_2 < 11m$

now 11m to nearest metre is

$10.5m \leq L_1 + L_2 < 11.5$

so only could be correct

I think this is a poor question. What is it if examiners are actually asking of the student?

8) ☒ could be true

6) ☒ must be true

Again which exactly is the examiner expecting from the student?

9) boys : girls

$720 : 700$

$\frac{3}{2} \times 720 : \frac{3}{2} \times 700$

$= 480 : 420$

study hours

study hours = 900

11) $P(\text{not friend}) = \frac{1420 - 900}{1420}$

$= \frac{520}{1420} = \frac{26}{71}$

10) if AB || CD

$2x + 10 = 3x - 20$

$x = 30^\circ$

so $3x - 20 = 70^\circ$

so $y = 180 - 70 = 110^\circ$

9) if $w = 60^\circ$

$2x + 10 = 60$

$x = 25$

so $3x - 20 = 55^\circ$

so $y = 125^\circ$

☒ y is bigger.

11) red : blue

purple 5 : 2

Yanhuo 30 : 9

$22\frac{2}{3} : 9$

so he can make $31\frac{1}{2}$ litres

purple paint

and has $7\frac{1}{2}$ litres left over.

$$12) (a+b)^4 = 16r^{20}$$

$$a^4 + 4b = 16r^{20}$$

$$\text{so } a^4 = 16$$

$$a = 2$$

$$r^{4b} = r^{20}$$

$$b = 5$$

13) class 28 students

mean height 12 boys 1.58

mean height 28 students 1.52

boys : girls

12 : 16

$$\frac{12 \times 1.58 + 16 \times x}{28} = 1.52$$

$$16 \times x = 28 \times 1.52 - 12 \times 1.58$$

$$x = \frac{28 \times 1.52 - 12 \times 1.58}{16}$$

$$= 1.475$$

check

$$1.58 \times 12 + 1.475 \times 16 = 1.52 \times 28$$

✓ true

$$14) xy = c$$

$$y = \frac{c}{x}$$

so y is directly proportional to $\frac{1}{x}$

15) Depth more than 5 metres.

t 0 to 7 & t 11 to 12

= 8 hours

At 12 noon is t=3 8m.

At 4pm is t=7 5m

change is -3m.

$$16) £18000 \times 0.75 \times 0.88^4$$

$$= £8096$$

$$17) 9 \text{ miles in 9 minutes} = 60 \text{ mph.}$$

$$70 \text{ mph} \times 1 \frac{36}{60} = 112 \text{ miles}$$

Petrol Stage 1 $\frac{9}{50}$

stage 2 $\frac{112}{40}$

$$\frac{9}{50} + \frac{112}{40} = 2.98$$

$$2.98 < 3.00$$

so demonstrated.

$$18) y = 0.5^x \quad x \geq 0$$

when $x = 0$ $y = 1$

but Nick has sketched at 0.5

$$19) \angle BDC = 24^\circ \text{ (angle in segment)}$$

for isosceles triangle FDC

$$\text{base angles } \frac{180 - 24}{2} = 78^\circ$$

$$\text{so } 3x = 180 - 78$$

$$x = 34^\circ$$

20)

Safe weight 450 kg

Upper limit = 527½ kg

Ben leaves min. 77½

450 kg

so the lift is safe to use.

21)

$$y = f(x)$$

$$f(x) = 0 \text{ at } -2.5 \text{ and } 1$$

$$f(x) > 0 \quad x > 2.5 \text{ or } x < 1$$

22)

$$0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5$$

$$-5 \quad 2 \quad 17 \quad 40 \quad 71$$

$$7 \quad 15 \quad 23 \quad 31$$

$$8 \quad 8 \quad 8$$

$$\text{for } an^2 + bn + c \quad a = \frac{8}{2} = 4$$

$$c = -5$$

$$a + b + c = 2$$

$$b = 3$$

$$\text{so } n^{\text{th}} \text{ term is } 4n^2 + 3n - 5$$

23) $y = ax^2 + bx + c$

$a = 1$

$y = x^2 + bx + c$

$-10 = 0 + 0 + c$

$c = -10$

at $(5, 0)$

$0 = 5^2 + 5b - 10$

$5b = -15$

$b = -3$

$y = x^2 - 3x - 10$

$y = (x - \frac{1}{2})^2 - \frac{9}{4} - 10$

$= (x - \frac{1}{2})^2 - \frac{49}{4}$

so turning point is

$(\frac{1}{2}, -\frac{49}{4})$

x-coordinate is $\frac{1}{2}$

alternatively we could have factorised $x^2 - 3x - 10$

$(x - 5)(x + 2)$

so roots are 5 and -2

and turning point is the midpoint of the roots

$\frac{2}{3} = \frac{1}{2}$

finally the x-coordinate is given by $-\frac{b}{2a} = \frac{3}{2} = \frac{1}{2}$

Not a lot of people know this.

24) Draw tangent at 1 second

Speed = $\frac{\Delta h}{\Delta t} = \frac{10 - 6.6}{2.5 - 0}$

$= 1.4 \text{ m/s}$



$EM^2 = 17^2 - 8^2$
 $EM = 15$

$d^2 = EM^2 + MB^2 + BC^2$

$= 15^2 + 8^2 + 30^2$

$d = \sqrt{1189}$

$\angle ECM = \sin^{-1} \frac{15}{\sqrt{1189}}$

$= 25.8^\circ$

25)

26) Area = $90 - (10 - x)(9 - 3x - 1)$

$65 = 90 - (10 - x)(8 - 3x)$

$(10 - x)(8 - 3x) = 25$

$80 - 30x - 8x + 3x^2 = 25$

$55 - 38x + 3x^2 = 0$

$3x^2 - 38x + 55 = 0$

Use Lizzi's method

$\Rightarrow x^2 - 38x + 165$

$\Rightarrow (x - 33)(x - 5)$

$\Rightarrow (x - \frac{3}{33})(x - \frac{3}{5})$

$\Rightarrow (x - 11)(3x - 5)$

which is indeed correct.

$50x = \frac{3}{5}$ or $x = 11$

we discount $x = 11$

$50x = \frac{3}{5}$

check Area = $90 - \frac{3}{25} \times 3 = 65$

✓ checks

This question gave me some difficulty, could I have completed under exam conditions? Worth 6 marks

Let me try another way

$65 = 10(3x + 1) + x(8 - 3x)$
 $65 = 30x + 10 + 8x - 3x^2$

$3x^2 - 38x + 55 = 0$

That was easier. I was trying to be too clever.

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