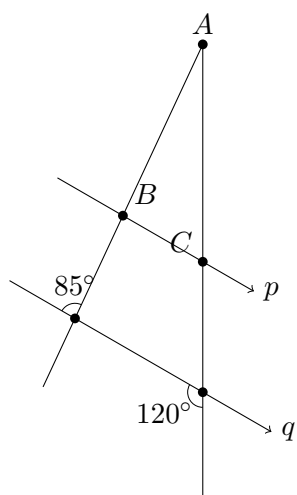


Problem 1: Lines p and q are parallel. Find the measures of INTERIOR angles in $\triangle ABC$:

$\angle A =$ 25° , $\angle B =$ 95° , and $\angle C =$ 60° .



The given angle 85° is corresponding to the exterior angle at B , so the interior angle, $\angle B = 180^\circ - 85^\circ = 95^\circ$. Similarly, 120° is a corresponding angle to the exterior angle at C , so $\angle C = 180^\circ - 120^\circ = 60^\circ$ form a straight line, so they add up to 180° . The last angle, namely, $\angle A$ is found by using triangle angle sum, so $\angle A = 180^\circ - 95^\circ - 60^\circ = 25^\circ$.

Score: /3

Problem 2: Set up a table to draw all rectangles with perimeter 12 cm whose dimensions are integral in centimetre(s). Of these rectangles, which one has the smallest area?

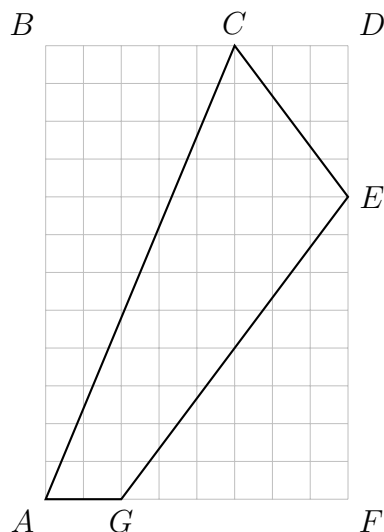
Rectangle: _____

Area: _____

If the perimeter is 12 cm, half of the perimeter is 6 cm, the sum of its length and width. Therefore, (l, w) may be $(5, 1)$, $(4, 2)$, $(3, 3)$ and its 90° rotation. The largest area is the 3×3 square of 9 cm^2 in area, and the smallest area is 5 cm^2 from the 5×1 rectangle .

Score: /3

Problem 3: Find the PERIMETER of the quadrilateral $ACEG$ enclosed in the given rectangle $ABDF$.



$$AC = \sqrt{5^2 + 12^2} = \sqrt{169} = 13$$

$$CE = \sqrt{3^2 + 4^2} = \sqrt{25} = 5$$

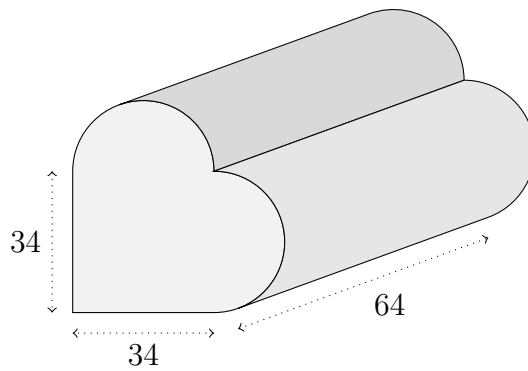
$$EG = \sqrt{6^2 + 8^2} = \sqrt{100} = 10$$

$$AG = 2$$

so the perimeter is $13 + 5 + 10 + 2 = 30$.

Score: /4

Problem 4: Euclid put two half cylinders on a square prism to make a heart prism. Find its surface area.



The area of the heart is $34^2 + \pi 17^2 = 1156 + 289\pi$ and its perimeter is $2 \times 34 + 2\pi 17 = 68 + 34\pi$. The surface area of the figure is therefore

$$\begin{aligned} 2(1156 + 289\pi) + 64(68 + 34\pi) &= 2312 + 578\pi + 4352 + 2167\pi \\ &= 6664 + 2754\pi \approx 15\,315.9 \text{ square units} \end{aligned}$$

Score: /3

Problem 5: Janette purchased a new pair of winter boots and paid \$112 at the cashier. Using BC's tax rate of 12%, calculate the ticket price on the boots before taxes.

If the price before taxes is \$ x , then $1.12x = \$112$, so $x = \frac{\$112}{1.12} = \100 .

Score: /3

Problem 6: How much would David's grandparents need to put in a GIC earning 3.5% to have a million dollars in 25 years? Use simple interest.

$1\,000\,000 = P(1 + 0.035 \times 25) = 1.875P$, so $P = 1\,000\,000/1.875 \approx 533\,333.33$ dollars.

If you use compound interest, then $1\,000\,000 = P(1 + 0.035)^{25} = 2.363\,244\,984P$, so $P = 423\,146.99$ dollars.

Score: /3

Problem 7: Brian's friend, Jay, graduated from university with a student loan of \$10 000 at 3% to be paid off in 4 years. Compute the monthly instalment payment.

Using simple interest, the total interest is $0.03 \times \$10\,000 \times 4 = \1200 . Jay therefore must pay a total of \$11 200, so the monthly payment is $\frac{\$11\,200}{4 \times 12} \approx \233.33 .

Using compound interest,

$$-10\,000(1 + r_p)^{48} + \frac{P}{r_p}((1 + r_p)^{48} - 1) = 0,$$

where $r_p = (1 + 0.03)^{(1/12)} - 1 \approx 0.246\,627\,0\%$, so the monthly payment is \$221.16.

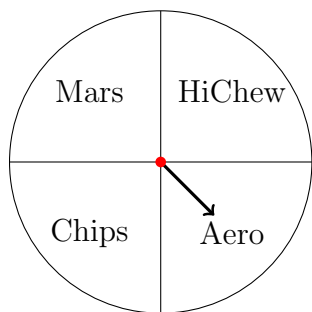
Score: /3

Problem 8: If *Capilano Express* credit card charges 20.5% on unpaid balance, how much would it cost in finance charge to leave \$370 unpaid past the due date for 60 days?

$$I = Prt = 370 \times 0.205 \times \frac{60}{365} \approx 12.47 \text{ dollars.}$$

Score: /2

Problem 9: Dad constructed a spinner with four equal sectors. Draw a sample space for spinning the spinner twice. Find the probability of getting a Mars Bar and a Hichew (in any order) after two spins.



The probability of getting a Mars Bar and a Hichew *in that order* is $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$. The probability of getting a Hichew and a Mars Bar in the other order is also $\frac{1}{16}$. The probability of getting a Mars Bar and a Hichew in any order is therefore $\frac{1}{16} + \frac{1}{16} = \frac{1}{8}$.

Score: /3

Problem 10: Ham and Sam selected the streaming services monthly for Hamlet and Samlette depending on the shows they wanted their children to watch. The following table shows the result of a survey according to age group and the number of streaming services used on average per month. Given that a participant is selected from the 16–30 age group, what is the probability that the participant is paying for 3 streaming services?

Age	Streaming services			
	1	2	3	4+
16–30	280	435	205	78
31–45	380	129	198	54
46–60	223	552	352	452
61+	121	673	236	22

$$\frac{205}{280+435+205+78} = \frac{205}{998} \approx 20.54\%.$$

Score: /3

Problem 11: Samlette liked puzzles. Ham showed her a puzzle of a sample space S as a rectangle containing two events A and B . Samlette knew that $P(S) = 100\%$, $P(A) = 90\%$, and $P(B) = 70\%$, with their overlap, $P(A \cap B) = 65\%$. Help Samlette find the following probabilities through the help of a Venn diagram.

- Draw a Venn diagram prescribed by the probabilities given.
- Find $P(A \cup B)$.
- Find $P(\overline{A \cup B})$.
- Find $P(A | B)$.

a. $P(A \cup B) = 0.9 + 0.7 - 0.65 = 0.95$.

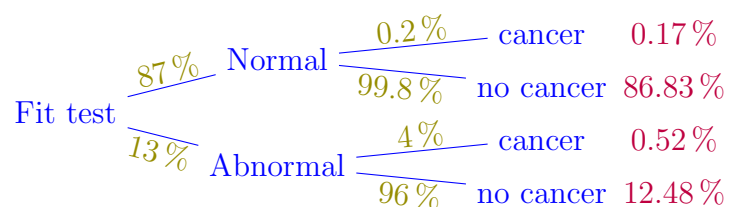
b. $P(\overline{A \cup B}) = 1 - P(A \cup B) = 0.05$.

c. $P(A | B) = \frac{P(A \cap B)}{P(B)} = \frac{0.65}{0.70} = 0.9286$.

Score: /4

Problem 12: No test is perfect. The fecal immunochemical test (FIT) is not 100% accurate, i.e. it may miss some colon cancer. Suppose 13% of those taking FIT gets abnormal results, of those, 4% has colon cancer while of those with normal FIT results, 0.2% has cancer. Starting with a FIT branching to Normal and Abnormal results first, then cancer or no cancer second, draw a probability tree for the FIT, then find the probability that given a patient with colon cancer, the patient gets a normal result (negative) for FIT.

The probability tree:



Therefore

$$P(- | C) = \frac{P(- \cap C)}{P(- \cap C) + P(+ \cap C)} = \frac{0.87 \cdot 0.002}{0.87 \cdot 0.002 + 0.13 \cdot 0.04} \approx 0.2507 = 25.07\%$$

This is alarmingly high, over a quarter of the time. This result shows the importance of paying attention to symptoms.

Score: /4